

**Claims**

1. Method in removal of internal bones in a fore-end of a split carcass, characterized in

- 5    - that a transport tool (27a) is brought to grip around the free end of the shank bone,  
- that the fore-end is pulled past cutting tools (1, 9, 15) by means of the transport tool,  
- that the cutting tools (1, 9, 15) hereby perform cutting operations along the shank  
bone and the humerus bone guided by these bones to free-cut at least partial these  
from the rest of the fore-end, and  
10   - that the articulations between at least the shank bone and the humerus bone and  
possibly also the connections of the humerus bone to the shoulder blade are  
maintained at least partially unbroken during the cutting operations, so that the  
tractive force from the transport tool (27a) by the grip of the tool around the free  
end of the shank bone is transferred to the bones via their unbroken connections.

15

2. Method according to claim 1, characterized in that at least one cutting tool (15) is also  
guided by the shoulder blade to perform cutting operations along this for loosening from  
the rest of the fore-end.

20 3. Method according to claim 1, characterized in that the fore-end is supported on a  
transport plane (3) during the cutting operations.

4. Method according to claim 1, characterized in that at least some of the cutting tools are  
flexibly suspended, so that during the cutting operation they are flexibly loaded against the  
25 shank bone, the humerus bone and/or the shoulder blade.

5. Method according to claim 1, characterized in that a machine makes two cuts along  
opposite sides of the shank bone near the free end of this before the transport tool (27a) is  
brought to grip around the free end of the shank bone, so that the transport tool can grip  
30 down into these two cuts and obtain contact with the shank bone.

6. Method according to claim 1, characterized in that the shank bone, the humerus bone  
and possibly the shoulder blade, after the cutting operations with the cutting tools (1, 9,

15), are moved in a direction upwards from the transport plane of the fore-end (3, 34), while the rest of the fore-end is kept at the transport plane by retaining means (33), whereby the shank bone and the humerus bone, and possibly the shoulder blade are removed from the fore-end.

5

7. Apparatus for use in removal of internal bones in a fore-end of a split carcass, **characterized** in that it comprises:

- a transport tool (27a) with grippers that can be brought to grip around the free end of  
10 the shank bone,
- a transport device (27) for the transport tool (27a) to pull the fore-end along a transport path,
- cutting tools (1, 9, 15) arranged along the transport path to perform cutting operations along the shank bone and the humerus bone guided by these bones to at  
15 least partial free-cut these from the rest of the fore-end when the fore-end is pulled past the cutting tools.

8. Apparatus according to claim 7, **characterized** in that at least one cutting tool is also guided by the shoulder blade to perform cutting operations along this for loosening from  
20 the rest of the fore-end.

9. Apparatus according to claim 7, **characterized** in that it comprises a transport plane (3) to support the fore-end during the cutting operations.

25 10. Apparatus according to claim 7, **characterized** in that at least some of the cutting tools are flexibly suspended, so that during the cutting operation they are flexibly loaded against the shank bone, the humerus bone and/or the shoulder blade.

11. Apparatus according to claim 7, **characterized** in that it comprises a cutting tool (15),  
30 which is designed to perform two cuts along opposite sides of the shank bone near its free end before the transport tool (27a) is brought to grip around the free end of the shank bone, so that the transport tool can grip down into these two cuts and obtain contact with the shank bone.

12. Apparatus according to claim 7, characterized in that it comprises a transport device (32) designed to move, after the cutting operations with the cutting tools (1, 9, 15), the shank bone, the humerus bone and possibly the shoulder blade in a direction upwards from the transport plane (3, 34) of the fore-end, and retaining means (33) designed to keep the 5 rest of the fore-end at the transport plane while the shank bone, the humerus bone and possibly the shoulder blade are moved in a direction upwards from the transport plane, whereby the shank bone, the humerus bone and possibly the shoulder blade are removed from the fore-end.

10 13. Positioning device to place the free end of the shank of a fore-end in a transport tool (27a), characterized in that it comprises a conveyor belt (23) to convey the fore-end with the shank in front in the direction towards the transport tool (27a), a funnel device (24) to guide the free end of the shank to fit tightly against the narrowed part of the funnel, a gripper (26) to grip the shank when the free end is in the narrowed part of the funnel 15 device, means to move the funnel device away from the fore-end when the gripper has gripped around the shank, and a transport device to move the gripper (26) with retained fore-end with the shank in front until the free end of the shank is placed in the transport tool (27a).

20 14. Device according to claim 13, characterized in that it comprises a cutting tool (25) to perform two cuts along opposite sides of the shank bone near its free end before the gripper (26) grips around the shank.

15. Transport device for conveying fore-ends with the shank in front with the fore-ends 25 retained in each of their own transport tool, characterized in that it comprises a conveyor (27) with a continuous chain of transport tools (27a), each of which is provided with means to grip around and retain the free end of the shank of a fore-end that is supplied at the entrance end of the conveyor.

30 16. Device according to claim 15, characterized in that each transport tool (27a) comprises a frame placed across the transport direction, in which frame the shank can be retained by displacement of the frame transversely to the transport direction.

17. Extraction device for extraction of the shank bone and the humerus bone and possibly the shoulder blade from a fore-end which is supplied supported on a transport plane, and in which fore-end the bones are at least partially cut free from the rest of the fore-end, characterized in that it comprises a transport device (32), which is designed to move the shank bone, the humerus bone and possibly the shoulder blade in a direction upwards from the transport plane (3, 34) of the fore-end, and retaining devices (33) which are designed to keep the rest of the fore-end at the transport plane while the shank bone, the humerus bone and possibly the shoulder blade are moved in a direction upwards from the transport plane, whereby the shank bone, the humerus bone and possibly the shoulder blade are removed from the fore-end.

18. Knife tool, characterized in that it comprises a blade (40) and a motor to turn the blade around an axle (40a) that is at right angles to the plane of the blade, that the blade at a distance from the axle has two cutting edges (40b) which meet in a point (40c), and that one of these cutting edges is located to the inward side of the circular arc that the point describes when the blade (40) is turned around the axle in the direction of the point, and the other cutting edge to the outward side of the circular arc, whereby the parts of the cutting edges have increasing distance from the circular arc in the direction backwards from the point (40c).

20

19. Knife tool according to claim 18, characterized in that the internal cutting edge (40b) has the shape of an arc with a smaller radius than the circular arc that the point (40c) describes when the blade is turned, and that the external cutting edge (40b) has the shape of an arc with a bigger radius than the circular arc that the point (40c) describes.

25